

Running head: BACKING UP BEHAVIORS

Backing Up Behaviors in Teams:  
The Role of Personality and Legitimacy of Need

Christopher O.L.H. Porter, John R. Hollenbeck, Daniel R. Ilgen, Aleksander P. J. Ellis,

Bradley J. West, and Henry K Moon

Eli Broad Graduate School of Management

Michigan State University

N475 North Business Complex

East Lansing MI 48824-1122

Christopher O.L.H. Porter is now at the Department of Management, Texas A&M University.

We presented an earlier version of this manuscript at the 16<sup>th</sup> Annual Conference for the Society of Industrial & Organizational Psychology, San Diego, CA.

This research was supported in part by Grant N00014-96-1-0983 from the Cognitive and Neural Sciences Division of the Office of Naval Research. Although support for this work is gratefully acknowledged, the ideas expressed herein are those of the authors and not necessarily endorsed by the funding agency.

Correspondence regarding this article to Christopher O.L.H. Porter, Department of Management, 4221 TAMU, Texas A&M University, College Station, Texas 77843-4221. Email: colhp@tamu.edu.

Report Documentation Page			Form Approved OMB No. 0704-0188		
Public reporting burden for the collection of information is estimated to average 1 hour per response, including the time for reviewing instructions, searching existing data sources, gathering and maintaining the data needed, and completing and reviewing the collection of information. Send comments regarding this burden estimate or any other aspect of this collection of information, including suggestions for reducing this burden, to Washington Headquarters Services, Directorate for Information Operations and Reports, 1215 Jefferson Davis Highway, Suite 1204, Arlington VA 22202-4302. Respondents should be aware that notwithstanding any other provision of law, no person shall be subject to a penalty for failing to comply with a collection of information if it does not display a currently valid OMB control number.					
1. REPORT DATE <b>2002</b>		2. REPORT TYPE		3. DATES COVERED <b>00-00-2002 to 00-00-2002</b>	
4. TITLE AND SUBTITLE <b>Backing Up Behaviors in Teams: The Role of Personality and Legitimacy of Need</b>			5a. CONTRACT NUMBER		
			5b. GRANT NUMBER		
			5c. PROGRAM ELEMENT NUMBER		
6. AUTHOR(S)			5d. PROJECT NUMBER		
			5e. TASK NUMBER		
			5f. WORK UNIT NUMBER		
7. PERFORMING ORGANIZATION NAME(S) AND ADDRESS(ES) <b>Michigan State University, Eli Broad Graduate School of Management, N475 North Business Complex, East Lansing, MI, 48824-1122</b>			8. PERFORMING ORGANIZATION REPORT NUMBER		
9. SPONSORING/MONITORING AGENCY NAME(S) AND ADDRESS(ES)			10. SPONSOR/MONITOR'S ACRONYM(S)		
			11. SPONSOR/MONITOR'S REPORT NUMBER(S)		
12. DISTRIBUTION/AVAILABILITY STATEMENT <b>Approved for public release; distribution unlimited</b>					
13. SUPPLEMENTARY NOTES <b>2002 Command and Control Research and Technology Symposium (CCRTS)</b>					
14. ABSTRACT					
15. SUBJECT TERMS					
16. SECURITY CLASSIFICATION OF:			17. LIMITATION OF ABSTRACT	18. NUMBER OF PAGES <b>44</b>	19a. NAME OF RESPONSIBLE PERSON
a. REPORT <b>unclassified</b>	b. ABSTRACT <b>unclassified</b>	c. THIS PAGE <b>unclassified</b>			

### Abstract

Backing up behavior has generally been defined as helping other team members perform their roles and is thought to be critical for effective performance in teams. To date, there has been no empirical investigation of backing up in teams, despite its importance. We develop and test an input–process–output model of backing up behavior in teams, proposing that backing up behavior in teams can be predicted at the team level by two types of team inputs: (1) team composition characteristics in terms of the personality of the members of the team and (2) team task characteristics in terms of the extent to which the nature of the task is one that legitimately calls for backing up behavior by members of the team. Results from a study of 71 teams performing a computerized tactical decision-making task suggest that the legitimacy of the need for back up has an important main effect on the extent to which team members provide assistance to and receive assistance from each other. In addition, legitimacy also has important interactive effects with both the personality of the back up recipient and the personality of the back up providers on backing up behaviors in teams.

## Backing Up Behaviors in Teams:

### The Role of Personality and Legitimacy of Need

While researchers and organizational practitioners have long been aware of the criticality of teamwork to effective team performance, to date, many of the specific aspects of teamwork have received little or no empirical attention. McIntyre and Salas (1995) identified four essential aspects of teamwork (performance monitoring, closed-loop communication, feedback, and backing up behaviors). They further suggested that backing up behaviors, the degree to which team members effectively help each other perform their roles, is perhaps the most critical of these four components of teamwork. Specifically, they noted that, “this skill is at the heart of teamwork, for it makes the team truly operate as more than the sum of its parts” (p. 26).

The purpose of the present study was to extend the empirical literature on teamwork by focusing on backing up behaviors in work teams. The model tested here is based on an input process output model (e.g., Hackman, 1987; McGrath, 1984) of team behavior and in this paper, we describe a study that examines both the main and interactive effects of two types of team inputs, namely team composition and team task characteristics, on backing up behaviors in teams (a team process). Specifically, we employ the Five Factor Model of personality to describe the composition of teams in terms of their back up recipients and back up providers. We focus on the legitimacy of the need for back up as an aspect of the team’s task and predict that team composition interacts with the legitimacy of the need for back up in determining the frequency of back up behaviors.

### Backing Up Behavior as a Construct

Back up behavior is critical to both the social and task performance of teams and has been generally defined as helping other team members perform their role (Dickinson &

McIntyre, 1997; McIntyre & Salas, 1995; Morgan, Glickman, Woodward, Blaiwes, & Salas, 1986). To effectively engage in backing up behaviors, team members must have an understanding of their team member's job and be both willing and able to provide and seek assistance when needed. Examples of backing up behaviors can include filling in for a team member who is unable to fulfill his or her role or helping a fellow team member correct mistakes that they have made in attempting to perform their role.

In this paper, we define backing up behaviors as the discretionary provision of resources and task-related effort to another member of one's team that is intended to help that team member obtain the goals as defined by his or her role when it is apparent that the team member is failing to reach those goals. We further recognize that backing up behaviors, much like helping behaviors in general, while often in response to specific requests for back up, often result from a recognition by potential back up providers that there is a workload distribution problem in their team. In other words, backing up behavior can occur in teams where the capacity of one team member is being surpassed while the capacity of other team members is being underutilized. When underutilized individuals back up the individual whose capacity is being surpassed, this allows the team to dynamically adjust and perform at a level that could not have been attained had they been working strictly as individuals. The current trend in organizations toward developing team-based structures is predicated on the very hope of just this type of dynamic readjustment, and thus there is clearly a need for research that examines when this does and does not occur in work teams.

Although there is a developing literature on helping behavior in general, there are three aspects of this literature that limit the types of inferences one can draw from it if one is specifically interested in helping in work teams. First, most research on helping has focused on

the frequency of help requests without a corresponding examination of capacity and workload (e.g., Lee, 1997). Unfortunately, such research does not allow one to discriminate between legitimate (i.e., those made when certain team members are experiencing especially high workloads) and illegitimate (i.e., those made when team members are experiencing low to normal workloads) needs for help. Our explicit recognition that backing up behavior can and often does occur as a result of a recognition of a workload-capacity distribution problem in teams is one that has not been a part of the general helping literature. Moreover, in some instances, a help request may not reflect an objective task need as much as an unwarranted dependency need or social loafing (Williams, Hawkins, & Latane, 1981) on the part of the help seeker which, in teams, is likely to have counterproductive effects on the team's performance as a whole. Since the types of variables that predict help requests in situations where there is a legitimate need may differ from the types of variables that predict less legitimate help requests, the approach proposed here is of critical importance for promoting team effectiveness.

Second, by focusing on the frequency of the help requests, the extant literature fails to speak to whether or not help was actually manifested. In other words, in some instances a help request in a team may actually lead to helping but in other instances it may not. In terms of team effectiveness, the critical dependent variable should be whether or not help was actually provided, not just whether it was requested. Backing up behavior implies the manifestation of help that is not necessarily captured solely by requests for help.

Finally, existing approaches to helping behaviors have focused almost exclusively at the dyadic level (e.g., Anderson & Williams, 1996; Williams and Anderson, 1991), rather than the team level. In a team, there is more than one person that can offer assistance, thus dyadic approaches are likely to overlook help that is offered by some other team member who is not part

of the focal dyad. That is, one person who might be predicted to help based upon dyadic theories may not do so because there is another individual who is in a better position to provide the needed help. Moreover, in teams, actual assistance may require the coordinated efforts of several members of a team. Dyadic approaches would fail to capture helping behaviors that are manifested, in part, as a result of levels of interdependence that are as high as those typically encountered in team settings. Thus, while dyadic approaches represent a valuable way of understanding helping behaviors, they fail to recognize that a great deal of help in teams is horizontal, not vertical; may require high levels of coordinated effort; and may be dependent on the workload distribution of the entire team—not just a single dyad. Simply stated, what is currently known about helping in work dyads may have limited utility in terms of both applicability and generalizability in understanding back up behaviors in teams.

Thus, the empirical study reported here is the first to differentiate help in terms of its legitimacy (in terms of workload capacity distributions), the first to examine this phenomenon at the team level, and the first to provide an objective measure of whether or not help actually ensued. By specifically focusing on backing up behaviors in teams, rather than helping more generally, we hope to establish some of the key factors that explain team effectiveness in complex and dynamic task environments.

#### A Model of Back Up Behavior in Teams

As a first step towards understanding backing up behaviors in teams, we develop a model based largely on an input–process–output model of team behavior (Hackman, 1987; McGrath, 1984). While there are a number of team inputs that could be considered, we focus on two types: 1) characteristics of the team's task and 2) characteristics of the team's composition. Given that this is but one (and to our knowledge the first) empirical investigation of backing up

behaviors in teams, we naturally had to make some decisions about what types of team inputs to focus on, however, this is not to suggest that there are not other team input variables that might also be predictive of backing up behaviors in teams (e.g., experience, status, etc.). Nevertheless, it is our belief that any theory of back up behaviors in teams needs to consider, at the very least, how the team is characterized in terms of the (a) the individual team member who needs assistance (i.e., the back up recipient), (b) the other team members who are available to provide such assistance (i.e., the back up providers), and (c) the nature of the team's task situation.

In regards to the team's composition, we employ the Five Factor Model (FFM) of personality (Costa & McCrae, 1992; Digman, 1990) to characterize teams as it relates to both their back up recipients and providers. We used the FFM of personality given its ability to succinctly describe individual differences and the predictive validity it has demonstrated across a range of organizational outcomes (e.g., Barrick & Mount, 1991). Of particular interest are four of the five dimensions of personality (Costa & McCrae, 1992; Digman & Inouye, 1986; Digman, 1989). Specifically, we explore the role of emotional stability, agreeableness, conscientiousness, and extraversion in predicting backing up behaviors in teams as, theoretically, all would seem to be related to the extent to which team members back up one another. We do not examine the role of openness to experience, the fifth dimension of personality, as it did not seem theoretically relevant. We differentiate the team's task characteristics in terms of the degree to which the recipient has a legitimate need for back up, namely an objective workload distribution problem.

In the sections that follow, we develop our hypotheses regarding the effects of personality in teams on backing up behavior. We predict that conscientiousness, emotional stability, and extraversion among back up recipients are key predictors of the extent to which back up occurs



in teams. We also predict that conscientiousness, emotional stability, and agreeableness among the back up providers are key predictors of the extent to which back up occurs in teams.

Our prediction that conscientiousness and emotional stability are important when one characterizes teams both in terms of their back up recipients and providers is based on previous research that has demonstrated that both of these personality characteristics have global relevance to work outcomes. For example, several researchers have examined the relationships among the Big Five personality characteristics and job performance in independent meta-analyses and also provided evidence that conscientiousness is a valid predictor across occupational groups and for all types of job criterion (Barrick & Mount, 1991; Hurtz & Donovan, 2000; Salgado, 1997). Similarly, Hurtz and Donovan (2000) found support for consistent, although somewhat low, levels of predictability for emotional stability across various job performance outcomes. In sum, conscientiousness and emotional stability are likely to be important predictors in our model regardless of whether we characterize teams in terms of back up recipients or providers. Extraversion and agreeableness, on the other hand, are likely to have more specific effects on backing up as they seem to be more or less important depending on whether one is characterizing teams in terms of the team member who receives the back up or the team members who provide the back up, respectively.

We use the legitimacy of the need for back up as the key feature of the situation in order to distinguish the provision of back up that promotes team effectiveness from back up that does not. We predict that the legitimacy of the need for back up will moderate the effects of personality in teams on backing up behaviors.

Legitimacy of Need: The Intersection of Workload and Capacity. Within every team, there are a number of individual performers who, given their interdependence on one another,

must coordinate their individual activities such that they function as a unit (Brannick & Prince, 1997; Zalesny, Salas, & Prince, 1995). It is also the case that individual work activities or task demands may differ across individuals in a team. As a result, members of the same team often have unique job responsibilities and unique workloads. If the workload distribution problem can be anticipated, it is possible to provide the person burdened with this role more resources in order to accomplish the task. If this type of resource compensation takes place, a team member who has a high workload may nevertheless not need a great deal of backing up behavior or support from teammates.

On the other hand, if the workload distribution problem could not be anticipated, and all teammates share the same level of resources, then uneven levels of task demands create a clear and direct need for back up. In this study, we define “legitimacy of need” in these terms. That is, when a team member with a high workload is given extra resources to deal with the high task demand, this person has no necessary need for back up. However, when a team member is faced with a higher level of task demands, but has not been compensated with extra resources, this creates a legitimate need for back up. Thus, Hypothesis 1 states that there will be a positive relationship between legitimacy of need and backing up behaviors in teams.

Although this hypothesis is straightforward, and perhaps obvious in terms of its implications, it sets the stage for our later hypotheses. Specifically, we argue below that in many cases, despite a clear and direct need for back up, this will not always result in backing up behaviors. That is, the relationship between legitimacy of need and back up behaviors will be moderated by both the traits of the back up recipient and potential back up providers. Similar to a number of recent investigations that have used team member personality as a predictor of both team processes and outcomes (Barrick, Stewart, Neubert, & Mount, 1998; Barry & Stewart,

1997; LePine, Hollenbeck, Ilgen, Hedlund, 1997), we use personality as a primary input to backing up behaviors in teams.

Back Up Recipients. In this study, we define back up recipients as those individuals in teams who, by the nature of the team's task, are responsible for a disproportionately heavy share of the workload. As previously mentioned, this may be offset by giving this person more resources, but in some situations it may not be anticipated, and thus result in a workload distribution problem (i.e., a legitimate need for back up).

In perhaps the most widely known study of its type, Barrick & Mount (1991) found strong evidence that conscientiousness was the most valid and reliable predictor of job performance across a wide range of occupations. A number of studies have also provided support for its utility in predicting job performance (Hough, Eaton, Dunnette, Kamp, & McCloy, 1990; Hurtz & Donovan, 2000; Ones, Viswesvaran, & Schmidt, 1993). Individuals who are low on conscientiousness are often disorganized, lackadaisical, unreliable, and impulsive (Costa & McCrae, 1992). Individuals who are high on conscientiousness are typically dependable, hard working, and achievement-oriented and they possess high levels of self-discipline and deliberateness in their actions. In team settings, individuals who are high on conscientiousness have been found to strive for successful task performance, irrespective of their roles or responsibilities (Zander & Forward, 1968). We believe that findings such as these have some clear implications for backing up behaviors in teams.

Specifically, we expect that when teams are characterized by the personality of their back up recipients, conscientiousness will be positively related to back up, but only when there is a legitimate need. Teams characterized as having back up recipients with high levels of conscientiousness, because of these individual's high levels of achievement-orientation, will

want to perform well at any cost. When teams are faced with a legitimate need for back up, those that have back up recipients who are high on this trait, will have a back up recipient who will demand back up, and hence be more likely to receive it. Because back up recipients in these teams will also tend to be self-reliant, these individuals will also be less likely to seek assistance when the team's situation is one where the need for back up is less legitimate. Hence, we would expect a crossed interaction, such that the highest and lowest levels of back up will be found among teams characterized as having back up recipients that are high on conscientiousness. That is, when legitimacy is high, high conscientiousness among back up recipients in teams will result in the most back up. When legitimacy is low, high levels of this same trait will result in the lowest levels of back up in teams. More formally, Hypothesis 2 states that in teams, recipient conscientiousness and legitimacy of need will interact in determining the amount of back up behaviors.

Like conscientiousness, emotional stability in teams should also relate to the extent to which back up behaviors occur in teams. Individuals who are low on emotional stability are often described as frustrated, hopeless, dependent, and socially anxious (Barrick & Mount, 1991; Costa & McCrae, 1992; Mount & Barrick, 1995). Costa and McCrae (1992) suggested that the disruptive emotions of such individuals often interfere with their ability to adapt to stressful situations thus they cope poorly with stress and high levels of task demands. In contrast, individuals who are high on emotional stability tend to remain calm, even-tempered, and relaxed under pressure (Barrick & Mount, 1991; Costa & McCrae, 1992). These individuals are likely to face stressful and demanding work situations without becoming upset or rattled.

We expect that when teams are characterized by the personality of their back up recipients, emotional stability will be positively related to back up, but only when there is a

legitimate need. Teams characterized as having back up recipients who are high on emotional stability, due to the recipient's ability to remain calm under pressure, should better discriminate between situations when back up is necessary and those when it is not. We expect that these teams will have a back up recipient who will demand back up, and hence be more likely to receive it. Because back up recipients in these teams will also tend to be self-reliant, these individuals will also be less likely to seek assistance when the team's situation is one where the need for back up is less legitimate. Thus, we expect to find that in these teams, there will be high levels of back up only when there is a legitimate need for it, and low levels of back up when the need for back up is less legitimate.

On the other hand, due to their inability to handle stressful situations such as high levels of task demands, we expect that teams characterized as having back up recipients with low levels of emotional stability will exhibit high levels of back up regardless of the legitimacy of the need for such assistance. In other words, back up recipients in teams who are low on emotional stability should be less discriminatory about whether or not back up is needed and thus demand and receive high levels of back up regardless of the legitimacy of the need. Hence, similar to Hypothesis 2, we expect a crossed interaction between emotional stability and legitimacy of need for back up, such that the highest and lowest levels of back up will be found among teams characterized as having back up recipients that are high on emotional stability. Thus, Hypothesis 3 states that in teams, recipient emotional stability and legitimacy of need will interact in determining the amount of back up behaviors.

Finally, extraversion, another one of the five factors of personality, might also be related to the back up behavior when one characterized teams in terms of the personality of their back up recipients. Extraversion reflects the degree to which individuals are gregarious, talkative,

assertive, and ascendant in social interactions (Barrick & Mount, 1991; Barry & Stewart, 1997). People who are low in this trait are often quiet, reserved, and submissive in social situations (Costa & McCrae, 1992).

Given the findings of previous research which suggests that much of the helping that occurs in work settings is in response to specific requests for help (Burke, Weir, & Duncan, 1976), we expect that levels of extraversion among back up recipients in teams might be positively related to the amount of back up provided and received. Simply stated, the higher the level of extraversion among the back up recipients of a team, the more likely that the need for back up will be communicated to others in the team who can provide such assistance. For example, in teams characterized as having back up recipients who are high on extraversion, we would expect there to be more verbal requests and/or demands for help. We also expect that in such teams, back up recipients, as a result of their talkativeness, would be more likely to keep potential back up providers informed of their levels of task demands and their levels of available resources. As a result, potential back up providers might be more likely to know when the back up recipient is in need of assistance. On the other hand, in teams characterized as having high levels of extraversion among back up recipients, we would expect that recipients would be more likely to seek excitement and activity and be less likely to secure back up when the legitimacy of their need for back up is low.

In contrast, in teams with back up recipients who are low on extraversion, the recipients may be unwilling or unable to express or assert themselves in an effort to secure back up, even when they need it. Thus, we again expect a crossed interaction where the highest and lowest levels of back up will be associated with high extraversion (i.e., highest when legitimacy is high, but lowest when legitimacy is low). More formally, Hypothesis 4 states that in teams, recipient

extraversion and legitimacy of need will interact in determining the amount of back up behaviors.

Back Up Providers. One particular advantage of our approach towards understanding backing up behaviors in teams is that rather than examining teams in terms of just the effects of back up recipients' personality, we also examine teams in terms of the effects of the back up providers' personality. Thus, our approach acknowledges that backing up is a dynamic process among members of a work team—one that is affected by both the team's providers and recipients. Moreover, this approach is consistent with more recent developments in the teams literature that have suggested that shared mental models allow for helping that is not initiated by help requests from recipients. When the team shares a common mental model, some help might come directly from team members who are anticipating the needs of others—even if those needs are not directly expressed (Marks, Zaccaro, & Mathieu, 2000).

With respect to how teams are characterized in terms of potential back up providers, we expect that conscientiousness will be positively related to back up, but only when there is a legitimate need. Given the aforementioned tendency of those high on conscientiousness to discriminate situations in which assistance is necessary from those in which it is not, we expect teams with high levels of conscientiousness among its back up providers to exhibit higher levels of back up behaviors when there is a high level of legitimacy for such assistance compared to when there is not. On the other hand, we also expect to find teams with low levels of conscientiousness among those who can provide assistance to provide low levels of back up regardless of the legitimacy of the need for it. Stated simply, low levels of conscientiousness in teams, as it relates to potential back up providers, will be associated with a tendency to fail to help others in those teams. Thus, again we would expect an interaction between

conscientiousness and legitimacy of need, such that the highest levels of back up will be found among teams characterized as having back up providers that are high on conscientiousness. Our prediction also suggests that there will be no difference between levels of back up provided in teams characterized as having back up providers that are low on conscientiousness irrespective of the legitimacy of the need for back up. It follows that Hypothesis 5 states that in teams, provider conscientiousness and legitimacy of need will interact in determining the amount of back up behaviors.

We also expect that emotional stability should be of particular importance when one characterizes teams in terms of their back up providers. Because of the task and outcome interdependence associated with teams, an imbalance of individual workload demands and individual workload capacity will have implications for the entire team's success. One might expect such a situation to be especially stressful for team members who are observing other overloaded team members. While emotionally stable individuals may rush in to help when such a need arises, those who are less emotionally stable might be more likely to let the overloaded individuals fend for themselves. If there were no legitimate need for back up, we would expect that teams characterized as having back up providers that are high on emotional stability to recognize it and show levels of back up that would be similar to that of those in teams characterized as having back up providers that are low on emotional stability. Thus, Hypothesis 6 states that in teams, provider emotional stability and legitimacy of need will interact in determining the amount of back up behaviors.

Finally, within the FFM of personality, agreeableness is related to characteristics like altruism and caring at one extreme, and hostility and indifference to others at the other end of the extreme. Those who are low on agreeableness are "egocentric, skeptical of others' intentions,



and competitive rather than cooperative” (Barrick & Mount, 1991; Costa & McCrae, 1992; Mount & Barrick, 1995). On the other hand, those who are high on agreeableness are typically courteous, trusting, and compliant (Barrick & Mount, 1991).

In the context of work teams, theoretically, agreeableness among back up providers in teams should be related to increased levels of backing up behaviors. For example, teams with back up providers who are high on agreeableness should be more cooperative than competitive. As noted by Costa & McCrae (1992), those high on agreeableness are “sympathetic to others and eager to help them, and believe that others will be helpful in return” (p. 15). This suggests that levels of agreeableness among back up providers in work teams should have an effect on backing up behaviors. Specifically, we expect that in teams with back up providers that are high on agreeableness, back up providers will provide unconditionally high levels back up whether or not there is a legitimate need for them to do so. We expect that in teams in which the back up providers can be characterized as low on agreeableness, there will be more differentiated levels of back up. That is, because of their outcome interdependence, when the legitimacy of the need is high, even providers who are relatively low on agreeableness will provide back up. When legitimacy is low, on the other hand, providers who are low on agreeableness will show very low levels of back up. Thus, Hypothesis 7 states that in teams, provider agreeableness and legitimacy of need will interact in determining the amount of back up behaviors.

## Method

### Participants

Two hundred eighty four male and female undergraduates at a large Midwestern university served as participants for this study and were randomly assigned to four-person teams (N = 71 teams). Participation in the study was voluntary, however, in exchange for their

participation, participants received course credit in an introductory management course.

Additionally, teams were eligible for cash prizes (\$40 per session) based upon team performance within conditions. Participants were informed of this opportunity prior to signing up for the research.

### Nature of the Team Task

Research participants worked on a modified version of the Distributed Dynamic Decision-Making (DDD) Simulation developed for the Department of Defense for research and training purposes (see Miller, Young, Kleinman & Serfaty, 1998 for a complete description). The generic DDD simulation is a realistic command-and-control simulator that has wide flexibility for portraying scenarios ranging from low to high fidelity (and complexity). Specifically, DDD is a computer simulation of a military command-and-control context in which participants monitor radar tracks and work interdependently to protect a restricted airspace from enemy tracks. The participants are responsible for working interdependently as a team to detect, identify, and disable any enemy tracks using the bases and vehicles that they themselves own and operate while at the same time they are to avoid disabling any friendly tracks. Thus, participants working on this task must make decisions and take independent actions, while at the same time, coordinate their plans and actions with others to manage the physical space they control.

The specific variant of this task used in this research was developed for contexts where teams are comprised of anywhere from 2 to 5 members who have little or no military experience. In this version of the simulation, each participant has a networked PC at his or her workstation and uses a computer mouse to control military sub-platforms, or assets, such as tanks, helicopters, jets, and AWACS reconnaissance planes, all of which have varying power and capabilities to disable tracks. Each team worked together in a common room, which was

partitioned so that people could not see their teammates' computer screens. It should be noted, however, that team members were in close proximity and could easily speak to one another. In fact, most teams could be characterized as having engaged in high levels of communication throughout the experiment. In this context, each team experienced an identical team task consisting of 100 separate tracks and lasting roughly 30 minutes. In each condition, there was the same number of each different type of track and the length of time each track stayed in the restricted airspace that the participants were to protect was equal across all conditions (see Hollenbeck, Moon, Ellis, Ilgen, Sheppard, West, Porter, & Wagner, in press for a more detailed description of the version of the DDD task used in this study).

Although the task demands were constant across all teams, within each team one team member (Decision Maker 2, or DM2) was intentionally given a disproportionately heavier share of the workload compared to the other members of the team. Specifically, DM2 experienced four waves of tracks in which several tracks (most of which were enemy) entered his or her quadrant all at once. No other team member experienced such wave of tracks entering his or her quadrant at any time during the task. In this way, we could objectively identify DM2 as the team member who, depending on his or her level of task resources, had a more or less legitimate need for back up from the other members of his or her team. Put another way, in each team DM2 always had higher levels of task demands relative to the other three members of his or her team (i.e., the workload was always distributed unevenly). As described below, DM2 either did or did not have the necessary task resources to effectively deal with those increased levels of task demands by him or herself and as a result of our level of control over the task environment, we were therefore confident in our ability to therefore operationalize DM2 as the sole back up recipient in each team.

## Procedures

All participants completed personality measures prior to the experiment as part of their introductory management course. Upon entering the laboratory for their scheduled three-hour experimental session, each participant indicated their agreement to participate in the study by signing a consent form. Participants were further informed that they would be participating in a study on team performance.

Next, each participant was randomly assigned to both a four-person team and one of four computer stations (i.e., either DM1, DM2, DM3, DM4) before the trainer began the 90-minute training session. Each four-person team was randomly assigned to one of the two conditions described in the section below. The first 30 minutes of the training were devoted to declarative knowledge regarding all the various details relevant to playing DDD. The remaining 60 minutes were devoted more toward procedural knowledge, as each team member became more familiar with the functions of the mouse (e.g., engaging tracks, identifying tracks, etc.). During the 60 minutes of hands-on practice, the team members were free to ask the trainer anything they wanted. The trainer could also help any team member having difficulty with any task or function. Moreover, it was during this point of the training when participants had the opportunity to get accustomed to working together, interdependently as a team. During the one-hour experimental session that immediately followed the training session, each team worked on the task described above. At no point during either the training or the experimental session were participants allowed to change computer stations with their teammates thus ensuring that our efforts at complete random assignment were not inadvertently reversed. After the experimental session was completed, all research participants were thanked and debriefed.

### Manipulations and Measures

Legitimacy of the Need for Back Up. As previously noted, the teams used in this study all worked in a task environment in which only DM2 had a disproportionately heavy share of the team's workload. We therefore operationalized DM2 as the potential back up recipient in each team as we were able to experimentally manipulate DM2's level of task resources. Specifically, we manipulated the legitimacy of the need for back up by varying the allocation of teams' assets (i.e., tanks, helicopters, jets, and AWACS planes which as we mentioned above varied in terms of power and capabilities). Each team was randomly assigned to either a high or low legitimacy condition. In the high legitimacy condition, each of the team members was responsible for one AWACS, one tank, one helicopter, and one jet. In this case, all team members had equal capacity. Given the nature of the task and the wave tracks, DM2 was clearly no more capable of clearing enemy tracks than the other team members despite having responsibility for a disproportionately heavy share of the workload. Therefore, in this condition, DM2 clearly required assistance from other members of the team to effectively deal with his or her task demands.

In the low legitimacy condition, DM2 was given all four tanks. Given the nature of the task and the wave tracks, when the resource structure was configured in this manner, DM2 was the most powerful of the team members. The reason for this is that in this task, tanks have the most weapons capacity and could disable virtually any track whereas helicopters, jets, and AWACS planes were increasingly less powerful. Thus, in teams in the low legitimacy condition, DM2 still had a high workload relative to the other members of his or her team, but given the resource allocation scheme, DM2 possessed all the resources necessary to effectively manage this workload without assistance. There was no such resource compensation for the occupant of the DM2 station

in teams randomly assigned to the high legitimacy condition. Finally, it should be noted that regardless of the resource structure, the overall capacity of all our study's teams was identical (i.e., each team had four of each type of the four sub-platforms for a total of 16 total resources).

Personality Traits. Emotional stability, conscientiousness, agreeableness, and extraversion were measured using the Revised NEO Personality Inventory (NEO-PI-R) (Costa & McCrae, 1992). Each trait was measured with 48 items. Participants were instructed to provide answers on a five-point Likert scale depending on how much they agreed or disagreed with each of the 48 items. For this study, the coefficient alpha estimates of reliability for emotional stability, agreeableness, conscientiousness, and extraversion were, .90, .88, .89, and .90, respectively. The personality of the team in terms of back up recipient's personality was operationalized as DM2's scores on each of the four dimensions while the personality of the team in terms of back up providers' personality was operationalized as the aggregate (mean) score of DM1, DM3, and DM4. We chose to use the average score for the providers because we wanted to study this process at the team, rather than dyadic level (for the reasons discussed in the introduction). Moreover, by dealing with personality at the level of the team, we better capture the dynamic processes and interactions that take place in interdependent team contexts. At the team level, an additive, as opposed to conjunctive or disjunctive approach seemed most reasonable given the way back up behaviors are counted in the execution of this task (i.e., they are added up) (see Steiner, 1972 and LePine et al., 1997 for more on the decision to, and implications of, using an additive approach to aggregate individual level data to the team level).

Backing Up Behavior. As previously discussed, "backing up" behavior can generally be defined as the extent to which team members help each other perform their roles. In this task, each team member is individually responsible for protecting one of four quadrants of the

restricted zone, however, all team members are collectively responsible for protecting the entire restricted zone as a team. As we noted, DM2 had the heaviest share of the team's workload, and since back up behaviors often result from a recognition of a workload distribution problem, DM2 was therefore designated as the back up recipient given that we could experimentally manipulate both our DM2s' levels of task demands in addition to the resources they had available to deal with those task demands. For this study, we calculated "backing up" behaviors as the total number of times that team members other than DM2 attacked and cleared an enemy wave track from the DM2 quadrant. Our operationalization of backing up behavior was designed to both exploit our ability to objectively measure actual helping behaviors given our laboratory context and to measure behaviors manifested by other members of the team that were directed towards DM2 and that should have had actual team level performance implications.

Statistical Analyses. We used four separate hierarchical regressions to test the study's hypotheses (one for each dimension of personality). In Step 1, we entered a dummy coded variable representing the legitimacy of the back up recipient's need for back up. In Step 2, we entered a variable representing the personality of the team's back up recipient. In Step 3, we entered a variable representing the personality of the team's back up providers. Step 4 added the interaction between the team's back up recipient's personality and the legitimacy of the need for back up. Finally, in Step 5, we entered the interaction between teams' back up providers' personality and the legitimacy of the need for back up.

## Results

Table 1 provides means, standard deviations, and zero-order correlations between each of the study's variables. Table 2 shows the results of the four hierarchical regressions that were conducted to test the hypotheses. As shown in the first row of this table, as hypothesized,

legitimacy of need did have a significant effect on backing up behaviors in teams. Thus, when back up recipients (DM2's) did not have the extra capacity to effectively handle their share of the workload, more backing up behaviors were provided by other members of the team (i.e., the back up providers). Of more interest, however, are the effects for the personality traits and how these interacted with legitimacy to affect backing up behaviors.

#### Interactions Between Recipient Personality and Legitimacy of Need

First, in line with Hypothesis 2, there was a statistically significant interaction between legitimacy and the level of conscientiousness on the part of the back up recipient as can be seen on Step 4 in the first and second columns of Table 2. The nature of this interaction can be seen in Figure 1, where it is evident that when legitimacy was high, teams that had recipients who were high on conscientiousness showed the most back up. When legitimacy was low, however, teams that had recipients who were high on this characteristic showed the least amount of back up.

Hypothesis 3 predicted that recipient emotional stability in teams would also interact with the legitimacy of the need for back up, however, we found no such support for this hypothesis as can be seen on Step 4 in the third and fourth columns of Table 2.

We did, however, find support for Hypothesis 4 which predicted that recipient extraversion in teams would interact with the legitimacy of need for back up. These results are similar to those of Hypothesis 2 and can be seen in the fifth and sixth columns of Table 2 (Step 4). The nature of this interaction, plotted in Figure 2, reveals that high levels of back up behavior were only evident when legitimacy was high and when the team's back up recipient was extraverted. Teams in which the team member occupying DM2 was low on extraversion failed to demonstrate high levels of backing up, even when it would have been highly appropriate (i.e., under high legitimacy conditions).



### Interactions Between Provider Personality and Legitimacy of Need

Step 5 of the regressions show the results for our predictions regarding the interactions of team's back up provider personality and the legitimacy of the need for back up. As can be seen on Step 5 in the first and second columns of Table 2, we did not find evidence of any interaction between provider conscientiousness in teams and legitimacy of the need for back as we predicted in Hypothesis 5.

The third and fourth columns of Table 2 (Step 5) show the results for emotional stability. As predicted, we found evidence of an interaction between provider emotional stability in teams and the legitimacy of the need for back up. This interaction was only marginally significant, however, as it was largely overshadowed by a very strong main effect for provider emotional stability (see Step 3) that suggested that teams low on emotional stability failed to provide much back up regardless of the task conditions. Nevertheless, the nature of this interaction is consistent with our predictions and is plotted in Figure 3. This figure shows that, in general, teams characterized as having providers who were low on emotional stability exhibited very little back up regardless of the nature of the task situation. Teams with providers who were emotionally stable were much more likely to come to the aid of DM2, and this was especially true when this person had a legitimate need, consistent with Hypothesis 6.

Finally, with respect to provider agreeableness, the seventh and eighth columns of Table 2 (Step 5) reveal no effects whatsoever for this trait. This is inconsistent with Hypothesis 7 as it stated that levels of back up behaviors in teams in which the providers were high on this trait would be high regardless of the legitimacy of the need for back up, and that for teams in which the providers were low on this trait, levels of back up behaviors would only be high when the legitimacy of the need for back up was high.

## Discussion

The purpose of this study was to develop and test a model of a specific and essential aspect of teamwork, namely backing up other team members. Backing up is critical to effective social and task performance in teams because it implies that team members are willing to provide help to others when their own task demands require less than their full attention and resources. In this paper, we focused on two types of team input variables in our efforts to predict backing up behaviors in teams, a team process variable (Marks, Mathieu, & Zaccaro, 2001). First, we examined the legitimacy of the need for back up as a characteristic of the team's task. Second, we examined team level personality as a characteristic of the team's composition. The results of our study demonstrated that the legitimacy of the need for back up and team personality have important main and interactive effects on backing up behaviors in teams.

Our approach to backing up behaviors in teams is the first to explicitly recognize that teams often experience situations in which individual team members have varying shares of the team's workload (i.e., task demands). In such situations, it is sometimes the case that some team members' workloads surpass their work capacity. Our results indicated that some team members transferred both their individual workloads and capacities to other team members to compensate for mismatches between workloads and capacities. It is in such situations (i.e., where there is a mismatch) that teamwork such as backing up others is likely to have positive consequences for performance at the team level. For example, while no formal, a priori predictions were made regarding the effects of back up behavior on teams' overall task performance, we were able to create overall measures of the task performance for each team. Specifically, each team obtained an offensive score that reflected the extent to which the team engaged enemy tracks and refrained from engaging friendly tracks during the task. The teams also obtained a defensive

score that reflected the extent to which they kept the restricted areas free of enemy tracks.

Supplemental analyses of our data indicated that backing up a team member with a particularly heavy share of the team's workload was positively related to team performance in terms of both offensive ( $r = .31, p < .01$ ) and defensive scores ( $r = .43, p < .01$ ), thus providing empirical evidence that backing up had positive effects on team performance (see Table 1).

A closer examination of our data, however, revealed that backing up behavior explained significantly more variance in the performance of teams in our high legitimacy condition compared to that explained in teams in our low legitimacy condition. Specifically, backing up behavior explained 42% of the variance in the defensive scores of high legitimacy teams compared to 31% of the variance in the defensive scores of low legitimacy teams. Similarly, almost twice as much variance in teams' offensive scores was explained in high legitimacy teams compared to that explained in low legitimacy teams (19% compared to 11%). While we had not planned to test for these effects a priori, these findings lend some empirical support to both our belief that backing up can be more important in some teams compared to others in addition to our thinking about backing up behaviors from an input-process-output framework. These findings also provide additional support for the distinction we made between situations in which the need to provide back up may be more or less legitimate than others.

Related to this, we would also argue that backing up may not always be functional in teams. Back up provided by other team members is likely to be dysfunctional in teams when it leads to back up providers neglecting their own individual task demands, especially if those tasks are also critical to the team's performance. Back up by other team members may also prove to be dysfunctional where the back up provided leads to redundant as opposed to complimentary behavior in the team. In both of these situations, we expect that backing up may even have

negative consequences on both team task performance and social outcomes. Indeed, the group performance literature has long recognized the problem of social loafing or excessive member dependency and how this can destroy team morale. Current approaches to helping in general have not clearly differentiated help requests and help behaviors in this fashion, and this may be an important omission if illegitimate requests for assistance truly detract from team performance and cohesiveness.

Although this study's findings lend strong support for the role of legitimacy of the need for back up as an important predictor of backing up in teams, perhaps of more interest are the findings associated with personality traits and the role they play in the backing up process. For example, our results for conscientiousness indicate from a new and different angle, why high levels of this trait are so valuable in work contexts. Specifically, recipients who were high in conscientiousness were the most discriminating of all individuals when it came to recognizing whether their need for back up was legitimate or not. Back up recipients who were high on this trait secured both the most back up (when it was needed) and the least back up (when it was not needed), and were the best at balancing the need for interdependence in teams with the need for self-reliance.

Although an interaction was seen with recipient extraversion that was similar to that seen with conscientiousness, it is worth noting that unlike recipient conscientiousness, we also saw a statistically significant main effect for extraversion. This implies that on average (and across conditions) back up recipients who were high on extraversion secured more help than those who were low on this trait. We also found that similar to back up recipients in teams who were high on conscientiousness, those high on extraversion showed some of the same self-reliance when legitimacy was low. Thus, in teams that had back up recipients who were high on extraversion,

there was evidence of good discrimination at the high end of the legitimacy continuum (the recipient tended to demand back up when they needed it), and at the low end (the recipient tended to forego back up when it was not needed).

On the other hand, teams with recipients who were low on extraversion, failed to show good discrimination at the high end of the legitimacy continuum. In these teams, recipients received similar levels of back up compared to that received by recipients who were high on extraversion when legitimacy was low, but they did not show the same tendency to receive back up when it was needed.

Turning to when we characterize teams in terms of their back up providers, we found no support for our hypothesis that provider conscientiousness interacts with the legitimacy of the need for back up in predicting back up behaviors in teams. We did, however, find some evidence for a main effect for provider conscientiousness, suggesting that teams that have higher levels of conscientiousness among their back up providers exhibit higher levels of back up regardless of whether or not the task situation demands it.

We also found both a main and interaction effect for emotional stability. The main effect revealed that on average teams with back up providers who were low on emotional stability provided much less back up relative to teams with back up providers who were high on this characteristic. Although this tendency was most pronounced under conditions of high legitimacy, one can see a difference between high and low emotional stability providers even at low levels of legitimacy. The effects for emotional stability were the strongest in terms of effects size, in that the main and interactive effects for this variable explained 16% of the variance in back up behaviors. Clearly, if one is hoping to see the type of dynamic readjustment of workload that one hopes to see in teams, then the level of emotional stability among team members becomes a

critical composition issue. Back up providers who were low on emotional stability appear to be unwilling or unable to concentrate on the problems of others. In this study, we found strong evidence that the self-focused nature of those providers may manifest itself as a tendency to fail to provide assistance to others even when working interdependently with them on team tasks.

We saw no effects for provider agreeableness despite that given the definition of agreeableness, this was, in our a priori opinion, the strongest candidate in this context. In fact, we expected to see the type of indiscriminate backing up in teams with highly agreeable potential back up providers that might have led to main effects such as those seen among providers who were low in emotional stability. While one potential explanation for this could be that the indiscriminate nature of backing up among agreeable team members was so high, that it was not even focused on the right person (i.e., the a priori specified potential back up recipient), our post-hoc analyses failed to support this explanation.

Another potential explanation for our inability to find any effects for back up provider agreeableness may be the level at which we examined this particular personality construct. Like the other personality variables examined in this study, our measure of agreeableness included six distinct facets, or sub-factors; however, unlike the other personality constructs we examined, only one of the sub-factors of agreeableness seemed to be theoretically related to backing up, namely altruism. Altruism is an active concern for others and a willingness to assist others in need of help (Costa & McCrae, 1992). Perhaps a more specific altruism measure may have exhibited more predictability than our more broad agreeableness measure that also purports to measure trust, straight-forwardness, compliance, modesty, and tender-mindedness, none of which we would expect to be theoretically related to backing up behaviors in teams.

### Limitations and Future Research

One potential limitation of this study is the fact that we did not measure any verbal communication that occurred in our teams. Our failure to directly measure the various forms of verbal communication that occurred in our teams (e.g., help requests) is worth noting given that many of our hypothesized effects for personality on backing up behaviors were predicated on personality having a more proximal effect on both the frequency and nature of the communication in our teams. As such, we cannot be certain that in our study personality had its effects on backing up through requested help, denials of help that was offered, the general updating of other team members about one's own mission status, or even silence on the part of the potential back up recipient.

As a result, we suggest that future research make specific attempts to collect data on the both the frequency and nature of the communication occurring in teams as to address potential questions about how personality affects backing up. However, it is important to note that, at least based on observations of our teams, neither the direction of the relationship nor the direction of the causal flow between help requests and other help related communications and actual helping behavior is as straightforward as one might think. For example, in many cases, teams that were uttering a large frequency of help requests were doing so because there was very little helping behavior actually taking place. On the other hand, in the most helpful teams, after a short period of time, backing up behavior became routine and implicit, and therefore a great deal of back up occurred in the absence of a large number of repeated requests for help. Thus, the relationship between help requests and the provision of back up in many cases was negative, because low levels of provision caused more requests.

Further, researchers should also be aware of the potential difficulty in operationalizing help related communications. Take for instance help requests. The following example demonstrates the difficulty in measuring, let alone defining, what might constitute an actual help request. In our study, DM2 could have stated in a calm voice, “I sure have a lot of action going on up here.” In this case, should we have considered this a help request or simply a descriptive statement? Some potential back up providers may have interpreted this as a help request—many probably would have not. Another DM2 may have made the same exact utterance, but voiced in panicked and plaintive tone. Most potential back up providers would probably have interpret the second statement as a help request even though it uses the same exact words that were formerly seen as a descriptive statement. If DM3 (a potential back up provider) had asked directly, “Hey does anybody need some help?” and DM2 responded “sure,” should we have considered this a help request? It did not originate with the back up seeker, so should it have been treated the same as a request that was initiated by DM2, or something different? If DM2 had said, “DM1 please send a helicopter to my quadrant,” and then repeats this for DM3 and DM4, would this have been three requests? If DM2 had said, “I want all three of you guys to send a helicopter to my quadrant,” would this have been one request?

In sum, while we feel that data on help requests has the potential to help researchers better understand backing up in teams, we believe that the aforementioned concerns regarding help related communications need to be addressed. Research that attempts to define and measure in addition to that which seeks to determine why, when, where, and with whom there is a positive, zero, or negative relationship between such help related communications and actual help would thus seem to be useful first steps if data on help related communications is to truly be of use to those further exploring backing up and other helping behaviors in teams.



A second potential limitation of this study was the laboratory context in which it occurred. Specifically, we examined backing up behavior in teams of undergraduate student participants working on a computerized military simulation. This research method allowed us to examine team inputs and processes under conditions of high realism without sacrificing experimental control (Ilgen, 1999). Moreover, this method allowed us to obtain an accurate and objective measure of the number of times backing up actually occurred in our teams (as opposed to simply requests for assistance which, as we mentioned in the Introduction, typifies much of the helping literature). Unfortunately however, our setting may raise some concerns regarding the generalizability of our findings to settings outside of the laboratory. We see this as only a potential limitation for several reasons.

First, despite working in the context of a laboratory in which participants may not develop an overwhelming concern for their team or their individual roles, our participants worked on a realistic team task with performance-based rewards. In fact, the teams utilized in this study could be best described as “tactical decision-making teams” in which 1) team members must make decisions under time pressure and threat; 2) team members must interact, participate, and coordinate their inputs; and 3) teamwork is essential to effective team performance (McIntyre & Salas, 1995). Our teams therefore were quite similar to many teams that actually exist in a number of real-world contexts (e.g., police and military organizations, hospitals, and airline crews).

However, our laboratory context is one in which we could not simulate the exact same psychological processes associated with the levels of urgency that may be involved with such real-world teams. Nevertheless, observations of our research participants suggest that they did in

fact take their individual and team roles seriously as indicated by participants' enthusiasm regarding the task and participants' verbally expressed concerns about the rewards.

Our research question should also be considered when evaluating the generalizability of our findings. Our explicit focus in this study was on the predictability of backing up behavior in teams personality and the legitimacy of the need for back up. While the teams utilized in this study worked on a computer-simulated team task in a laboratory setting, there is nothing about our predictions that would suggest that they would not hold in such a context. Our dependent variable, backing up behavior, necessitated the use of a team context irrespective of whether the team was a laboratory team or one that existed in the real world. Given the nature of our research question, we believe that the laboratory provided an appropriate context for theoretically driven, preliminary examinations of what might happen in the field (Ilgen, 1986).

Given the increased reliance on teams and teamwork in contemporary work organizations, we believe that backing up in teams clearly represents an important avenue for future empirical research. As previously mentioned, the study reported in this article represents the first empirical study of this type of teamwork and there is much room for future research. While we later suggest that future research examine the direct effects of backing up and other manifestations of teamwork on team performance, we also suggest that backing up represents an important, yet often ignored team process in its own right that should be explored.

One clear avenue for future research on backing up in teams is the examination of other task and situational features that might be predictive of the backing up in teams. In this study, we specifically examined the legitimacy of the need for back up as indicated by the nature of the team's task (i.e., the intersection of team members' task demands relative to their individual capacity). However, there are other features of a team's task and situation that may suggest the

extent to which there is a legitimate need for back up. For example, McIntyre and Salas (1995) suggested that in effective teams, members have a vested interest in each other's performance and should monitor each other closely. Thus, one might expect that the nature of the feedback that an individual team member receives might signal to others the extent to which that individual may have a legitimate need for assistance. Similarly, other indicators of a team member's success may affect the extent to which others provide assistance to that individual in addition to the extent to which that individual asks for and/or accepts assistance from others.

Another useful direction for future research would be the examination of other individual differences that may be predictive of backing up in teams. As a first step in developing a model of backing up in teams, our study focused solely on a well-accepted conceptualization of personality (i.e., the FFM); however a number of other individual differences and other composition variables (e.g., team size, demographic similarity, or skill level) may be particularly useful for predicting backing up.

Somewhat related, it is worth noting again that backing up is but one form of teamwork (and thus type of helping) that can occur in teams. While backing up behaviors are best thought of as actual, physical, observable behavioral manifestations of helping behavior, there are other ways in which team members can assist one another. As mentioned above, McIntyre and Salas (1995) suggested that in effective teams, members monitor one another's performance and provide feedback to each other. In actual work teams, this sort of helping may be more knowledge or cognitive focused (e.g., advice or strategies). It might be fruitful for future research to determine if other inputs such as cognitive ability or task experience might be relevant when predicting these other forms of teamwork. Further, our explicit focus on backing up behaviors

should not, and does not, imply that that performance monitoring, feedback, and closed loop communication are any less important forms of teamwork processes.

Finally, while we believe that backing up is an important team construct in-and-of-itself, another potential direction for future research would be to explore the effects of backing up and the failure to back up on other aspects of team effectiveness. Hackman (1987) suggested that team effectiveness is much more complex than just task performance. Team effectiveness also includes other social and personal criteria that are often ignored in the team literature. Specifically, Hackman identified three aspects of team effectiveness—the actual output of the group (performance), the impact of the group experience on individual members (member satisfaction), and the state of the group as a performing unit (the ability to remain as a group). It would be interesting to examine the relationship between back up in teams on these other, more social criteria, as this would provide a more complete picture of the effects of backing up on teams.

## References

- Anderson, S. E., & Williams L. J. (1996). Interpersonal, job, and individual factors related to helping processes at work. Journal of Applied Psychology, 81, 282-296.
- Barrick, M. R., & Mount, R. K. (1991). The big five personality dimensions and job performance: A meta-analysis. Personnel Psychology, 44, 1-26.
- Barrick, M. R., Stewart, G. L., Neubert, M. J., & Mount, M. K. (1998). Relating member ability and personality to work-team processes and team effectiveness. Journal of Applied Psychology, 83, 377-391.
- Barry, B., & Stewart, G. L. (1997). Composition, process, and performance in self-managed groups: The role of personality. Journal of Applied Psychology, 82, 1, 62-78.
- Brannick, M. T., & Prince, C. (1997). An overview of team performance measurement. In M. T. Brannick, E. Salas, & C. Prince (Eds.), Team performance assessment and measurement: Theory, methods, and applications (pp. 3-18). Mahwah, NJ: Lawrence Erlbaum Associates, Inc.
- Burke, R. J., Weir, T., & Duncan, G. (1976). Informal helping relationships in work organizations. Academy of Management Journal, 19, 370-377.
- Costa, P. T., & McCrae, R. R. (1992). Revised NEO Personality Inventory manual. Odessa, FL: Psychological Assessment Resources, Inc.
- Dickinson, T. L., & McIntyre, R. M. (1997) A conceptual framework for teamwork measurement. In M. T. Brannick, E. Salas, & C. Prince (Eds.), Team performance assessment and measurement (pp. 19-43). Mahwah, New Jersey: Lawrence Erlbaum Associates, Inc.
- Digman, J. M. (1989). Five robust trait dimensions: Development, stability, and utility. Journal of Personality, 57, 195-214.

Digman, J. M. (1990). Personality structure: Emergence of the five-factor model. Annual Review of Psychology, *41*, 417-440.

Digman, J. M., & Inouye, J. (1986). Further specification of the five robust factors of personality. Journal of Personality and Social Psychology, *50*, 116-123.

Hough, L. M., Eaton, N. K., Dunnette, M. D., Kamp, J. D., & McCloy, R. A. (1990). Criterion-related validities of personality constructs and the effects of response distortion on those validities. Journal of Applied Psychology, *75*, 581-595.

Hackman, J. R. (1987). The design of work teams. In J. Lorsch (Ed.), Handbook of organizational behavior (pp. 315-342). Englewood, NJ: Prentice-Hall.

Hollenbeck, J. R., Moon, H., Ellis, A., Ilgen, D. R., Sheppard, L., West, B., Porter, C. O. L. H., & Wagner, J. A., III. (In press). Structural contingency theory and individual differences: Examination of external and internal person-team fit. Journal of Applied Psychology.

Hurtz, G. M., & Donovan, J. J. (2000). Personality and job performance: The Big-Five revisited. Journal of Applied Psychology, *85*, 869-879.

Ilgen, D. R. (1999). Teams embedded in organizations: Some implications. American Psychologist, *54*, 129-139.

Ilgen, D. R. (1986). Laboratory research: A question of when, not if. In E. A. Locke (Ed.), Generalizing for laboratory to field settings. Lexington, MA: Lexington Books.

Lee, F. (1997). When the going gets tough, do the tough ask for help? Help seeking and power motivation in organizations. Organizational Behavior and Human Decision Processes, *72*, 336-363.

LePine, J.A., Hollenbeck, H.R., Ilgen, D.I., Hedlund, J. (1997). Effects of individual differences on the performance of hierarchical decision-making teams: Much more than *g*.

Journal of Applied Psychology, 82, 803-811.

McGrath, J. E. (1984). Groups: Interaction and performance. Englewood Cliffs, NJ: Prentice Hall.

McIntyre, R. M., & Salas, E. (1995). Measuring and managing for team performance: Lessons from complex environments. In R. A. Guzzo & E. Salas (Eds.), Team effectiveness and decision-making in organizations (pp. 9-45). San Francisco: Jossey-Bass Publishers.

Marks, M. A., Mathieu, J. E., & Zaccaro, S. J. (2001). A temporally based framework and taxonomy of team processes. Academy of Management Review, 26, 356-376.

Miller, D. L., Young, P., Kleinman, D., & Serfaty, D. (1998). Distributed dynamic decision-making simulation Phase I Release notes and user's manual. Woburn, MA: Aptima, Inc.

Morgan, B. B., Jr., Glickman, A. S., Woodward, E. A., Blaiwes, A., & Salas, E. (1986). Measurement of team behaviors in a Navy environment. (NTSC Report No. 86-014). Orlando, FL: Naval Training System Center.

Mount, M. K., & Barrick, M. R. (1995). The big five personality dimensions: Implications for research and practice in human resource management. In K. M. Rowland & G. Ferris (Eds.), Research in personnel and human resource management (Vol. 13, pp. 153-200).

Ones, D. S., Viswesvaran, C., & Schmidt, F. L. (1993). Meta-analysis of integrity test validities: Findings and implications of personnel selection and theories of job performance [monograph]. Journal of Applied Psychology, 78, 679-703.

Salgado, J. F. (1997). The five-factor model of personality and job performance in the European community. Journal of Applied Psychology, 82, 30-43.

Sundstrom, E., De Meuse, K. P., & Futrell, D. (1990). Work teams: Applications and effectiveness. American Psychologist, 45, 120-133.

Williams, K. D., Hawkins, S., Latane, B. (1981). Identifiability as a deterrent to social loafing: Two cheering experiments. Journal of Personality and Social Psychology, 40, 303-311.

Zalesny, M. D., Salas, E., & Prince, C. (1995). Conceptual and measurement issues in coordination: Implications for team behavior and performance. In G. R. Ferris (Ed.), Research in personnel and human resource management (pp. 81-115). Greenwich, CT: JAI Press.

Zander, A., & Forward, J. (1968). Position in group, achievement motivation, and group aspirations. Journal of Personality and Social Psychology, 8, 282-288.



Table 1. Means, Standard Deviations, and Zero-Order Correlations Among Study Variables (N = 71)

	M	SD	1	2	3	4	5	6	7	8	9	10	11
1. Backing Up Behaviors	13.31	4.20											
2. Overall Offensive Score	1182.42	79.76	.32*										
3. Overall Defensive Score	31961.47	5626.74	.43*	.55*									
4. Legitimacy of the Need for Back Up	.49	.50	.49*	-.06	-.16								
5. Recipient Conscientiousness	3.52	.34	.08	-.06	-.05	.05							
6. Recipient Agreeableness	3.31	.40	.12	.02	-.02	.02	.14						
7. Recipient Emotional Stability	3.15	.45	-.23	-.02	.26*	-.34*	.40*	.13					
8. Recipient Extraversion	3.56	.43	.17	.17	.08	-.06	.29*	.37*	.26*				
9. Provider Conscientiousness	3.44	.24	.19	.18	.16	.02	.14	.16	.03	.07			
10. Provider Agreeableness	3.26	.21	-.03	-.03	.15	-.14	.01	.36*	.11	.03	.15		
11. Provider Emotional Stability	3.15	.26	.38*	.12	.18	.06	.15	.09	.05	.02	.40*	.22*	
12. Provider Extraversion	3.53	.24	-.03	-.04	.05	-.07	.16	.24*	.16	.19	.43*	.41*	.41*

\*  $p < .05$ .

Table 2. Results of Hierarchical Regression of Backing Up Behaviors on Various Facets of Personality and Legitimacy of the Need for Back Up (N = 71)

	Conscientiousness		Emotional Stability		Extraversion		Agreeableness	
	$\underline{R}^2$	$\Delta \underline{R}^2$	$\underline{R}^2$	$\Delta \underline{R}^2$	$\underline{R}^2$	$\Delta \underline{R}^2$	$\underline{R}^2$	$\Delta \underline{R}^2$
Step 1. Legitimacy of Need for Back Up	.24**	.24**	.24**	.24**	.24**	.24**	.24**	.24**
Step 2. Recipient Personality	.24**	.00	.24**	.00	.28**	.04†	.25**	.01
Step 3. Provider Personality	.27**	.03*	.37**	.13**	.28**	.00	.25**	.00
Step 4. Legitimacy $\times$ Recipient	.33**	.06**	.38**	.01	.37**	.09**	.26**	.01
Step 5. Legitimacy $\times$ Provider	.33**	.00	.41**	.03†	.37**	.00	.28**	.02
Total $\underline{R}^2$	.33**		.41**		.37**		.28**	

†  $p < .10$ . \*  $p < .05$ .

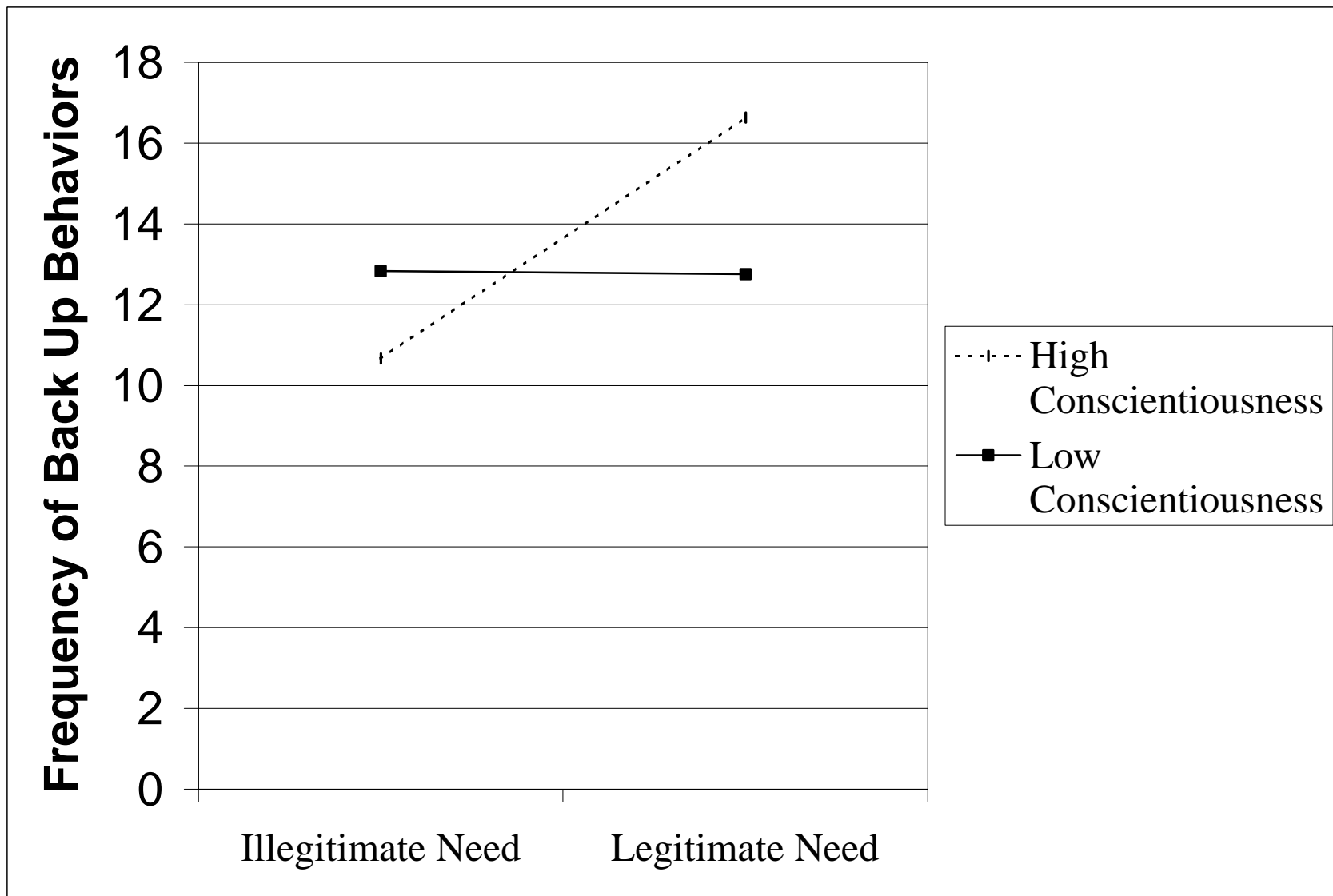


Figure 1. Interaction between recipient conscientiousness and legitimacy of need for back up.

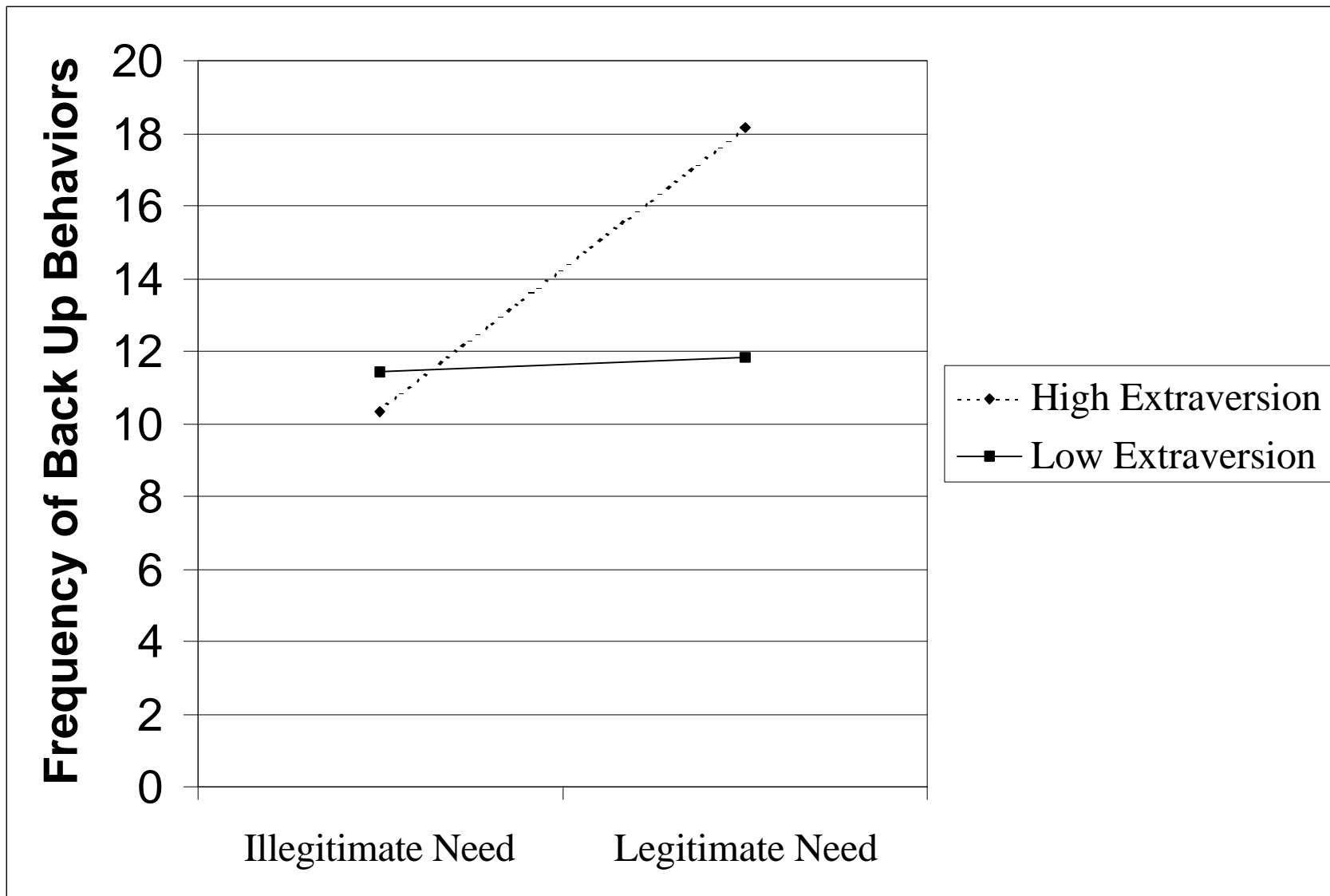


Figure 2. Interaction between recipient extraversion and legitimacy of need for back up.

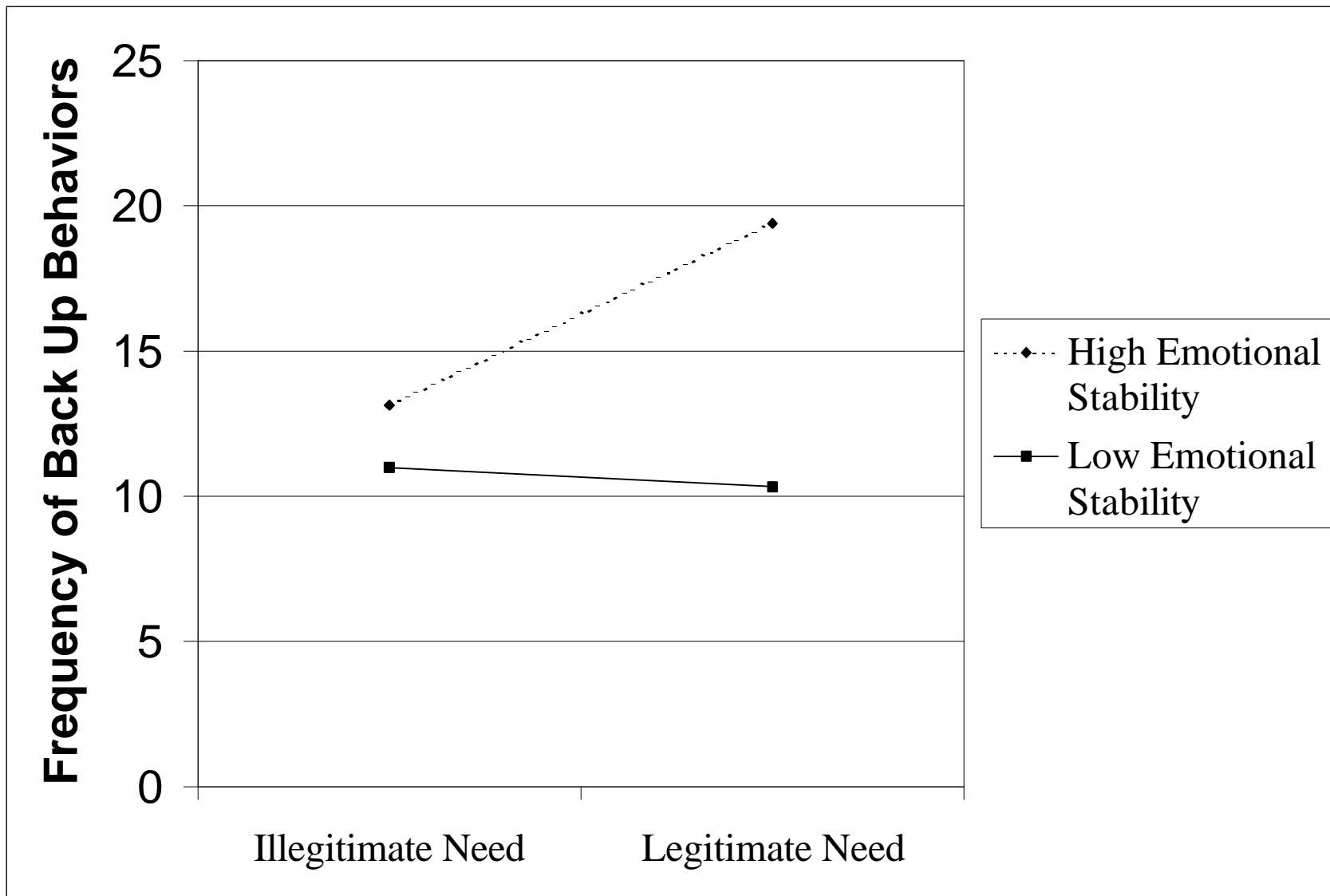


Figure 3. Interaction between provider emotional stability and legitimacy of need for back up.